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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/055,986 | 01/28/2002 | Masako Takayama | 107439-00063 | 6687 |

7590 08/24/2005

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| EXAMINER | |
|---|---|
| DUONG, THANH P | |
| **ART UNIT** | **PAPER NUMBER** |
| 1764 | |

DATE MAILED: 08/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/055,986 | TAKAYAMA ET AL. | |
| | Examiner | Art Unit | |
| | Tom P. Duong | 1764 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *09 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) *15-19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

Applicants' remarks and amendments filed on June 9, 2005 have been carefully considered. Claims 1-2 and 8-9 have been amended. Claims 15-19 have been withdrawn. Claims 1-19 are pending in this application.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al. (5,874,051) in view of Yamamoto (6,634,168) and Takeuchi et al. (4,774,217).

Regarding claims 1-2 and 7, Heil discloses a carbon device (Fig. 1) for carbon monoxide removal by selective oxidation (Abstract) comprising: a carbon monoxide selective oxidation catalyst layers (5) each containing a carbon monoxide selective oxidation catalyst (Col. 3, lines 20-27) which reduces the concentration of carbon monoxide contained in a gas by oxidation, wherein said carbon monoxide selective oxidation catalyst layers are serially connected (Fig. 1) to each other, an air introducing unit (4), and a gas temperature controlling unit (7), wherein said air introducing unit and said gas temperature controlling unit are disposed at the upstream side of said carbon monoxide selective oxidation catalyst layer in the flow direction of said gas (Fig. 1); a

carbon monoxide selective oxidation catalyst layers (5) each containing a carbon monoxide selective oxidation catalyst or precious metal (Col. 3, lines 38-40) which reduces the concentration of carbon monoxide contained in a gas by oxidation (Col. 3, lines 23-27), wherein said carbon monoxide selective oxidation catalyst layers are serially connected (Fig. 1) to each other, the temperature controlling unit (6), an air introduction unit (3), and a gas mixing unit (8) are provided between the carbon monoxide selective oxidation catalyst layers (5), wherein a reformed gas discharged from the temperature controlling unit (6) is introduced into the air introduction unit (3), the reformed gas being discharged from the air introduction unit into the gas mixing unit (8) and the reformed gas discharged from the gas mixing unit (8) being introduced into the carbon monoxide selective oxidation catalyst layers (5) as a flow direction of the gas is from an upstream side to a downstream side of the carbon monoxide selective oxidation catalyst layers (5). Heil fails to disclose the amount of metallic catalyst contained in each of said carbon monoxide selective oxidation catalyst layers is larger than the amount in the preceding carbon monoxide selective oxidation catalyst layer from the upstream side to the downstream side in the flow direction of said gas.

Yamamoto teaches the downstream catalyst (12) contains a larger catalyst amount (Col. 2, lines 24-35) than the upstream catalyst (10) to sufficiently oxidize CO (Col. 1, lines 5-10) and remove even slightly oxidizable hydrocarbons (Col 2, lines 55-60). Takeuchi also teaches it is desirable to provide a higher catalyst density on the downstream side than the upstream side (Col. 3, lines 25-30) to minimize the deactivating of the catalyst substance on the downstream side or to maintain the

catalytic activity on the downstream side (Col. 6, lines 53-63). Thus, it would have been obvious in view of Yamamoto and Takeuchi to one having ordinary skill in the art to modify the apparatus of Heil with a catalyst layer on the downstream side having a larger catalyst amount than on the preceding catalyst layer as taught by Yamamoto and Takeuchi in order to effectively oxidized the CO and/or remove oxidizable hydrocarbons. With respect to the cooling medium flows in a direction crossing the flow direction of the gas in the carbon monoxide selective oxidation catalvst, it is conventional to provide a cross flow cooling medium to control the temperature of the reaction and it would have been obvious to do so here since cross flow cooling medium is thermally more efficient than parallel flow cooling medium. Regarding claims 3-4, Heil shows the reactor chamber (2) is provided with a catalyst layers (5) connected in series. Regarding claims 5 and 6, it is conventional to provide a second carbon monoxide selection oxidation catalyst layer arranged in parallel and it would have been obvious to do so here to allow the oxidize layers and/or beds to continuously purifying the CO while the other is being regenerated.

2. Claims 8-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heil et al. (5,874,051) in view of Iwaoka '107 and Takahata et al. '610. Regarding claims 8-11 and 14, Heil discloses a carbon device (Fig. 1) for carbon monoxide removal by selective oxidation (Abstract) comprising: a carbon monoxide selective oxidation catalyst layers (5) each containing a carbon monoxide selective oxidation catalyst (Col. 3, lines 20-27) which reduces the concentration of carbon monoxide contained in a gas

by oxidation, wherein said carbon monoxide selective oxidation catalyst layers are serially connected (Fig. 1) to each other, an air introducing unit (4), and a gas temperature controlling unit (7), wherein said air introducing unit and said gas temperature controlling unit are disposed at the upstream side of said carbon monoxide selective oxidation catalyst layer in the flow direction of said gas (Fig. 1); a carbon monoxide selective oxidation catalyst layers (5) each containing a carbon monoxide selective oxidation catalyst or precious metal (Col. 3, lines 38-40) which reduces the concentration of carbon monoxide contained in a gas by oxidation (Col. 3, lines 23-27), wherein said carbon monoxide selective oxidation catalyst layers are serially connected (Fig. 1) to each other, the temperature controlling unit (6), an air introduction unit (3), and a gas mixing unit (8) are provided between the carbon monoxide selective oxidation catalvst lavers (5), wherein a reformed gas discharged from the temperature controlling unit (6) is introduced into the air introduction unit (3), the reformed gas being discharged from the air introduction unit into the gas mixing unit (8) and the reformed gas discharged from the gas mixing unit (8) being introduced into the carbon monoxide selective oxidation catalyst layers (5) as a flow direction of the gas is from an upstream side to a downstream side of the carbon monoxide selective oxidation catalvst layers (5). Heil fails to disclose the length of each of said carbon monoxide selective oxidation catalyst layer is longer than the length of the preceding carbon monoxide selective oxidation catalyst layer from the upstream side to the downstream side in the flow direction of said gas. Iwaoka '107 teaches the second catalyst layer 17 with a longer length located downstream of the first catalytic layer 12 (Col. 3, lines 14-20) to provide a

high purification ratio (Col. 1, lines 57-68) and prevent excessive temperature rise in the catalyst layers. Takahata '610 also teaches the importance of providing a upstream catalyst layer with a shorter length preferably 1/10 to 3/10 to the total catalyst length in order to control temperature in the upstream catalyst layer and maintain the catalyst activity level in the downstream (Col. 8, lines 17-30). Thus, it would have been obvious in view of Iwaoka and/or Takahata to one having ordinary skill in the art to modify the apparatus of Heil with a longer length of the catalyst layer on the downstream than the upstream catalyst layer as taught by Iwaoka and/or Takahata in order to control the temperature in the catalyst layers and maintain the sufficient catalytic activity level on the downstream catalyst layer. With respect to the cooling medium flows in a direction crossing the flow direction of the gas in the carbon monoxide selective oxidation catalvst, it is conventional to provide a cross flow cooling medium to control the temperature of the reaction and it would have been obvious to do so here since cross flow cooling medium is thermally more efficient than parallel flow cooling medium. Regarding claims 12 and 13, it is conventional to provide a second carbon monoxide selection oxidation catalyst layer arranged in parallel and it would have been obvious to do so here to allow the oxidize layers and/or beds to continuously purifying the CO while the other is being regenerated.

***Response to Arguments***

Applicant's arguments filed 6/9/05 have been fully considered but they are not persuasive. With respect to Applicants' arguments that the prior art fails to disclose or suggest the added limitations in claims 1 and 8, Examiner respectfully disagrees. Heil discloses the temperature controlling unit (6), an air introduction unit (3), and a gas mixing unit (8) are provided between the carbon monoxide selective oxidation catalvst lavers (5), wherein a reformed gas discharged from the temperature controlling unit (6) is introduced into the air introduction unit (3), the reformed gas being discharged from the air introduction unit into the gas mixing unit (8) and the reformed gas discharged from the gas mixing unit (8) being introduced into the carbon monoxide selective oxidation catalyst layers (5) as a flow direction of the gas is from an upstream side to a downstream side of the carbon monoxide selective oxidation catalvst layers (5). With respect to the argument of that the prior fails to disclose the cooling medium in cross flow with the direction of the flow of the gas, it is conventional to provide the cooling medium with cross flow instead of parallel flow and it would have been obvious to do so here, since cross flow cooling medium provide more efficient heat transfer than parallel flow (See USPN 4,799,539 and USPN 5,915,469).

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

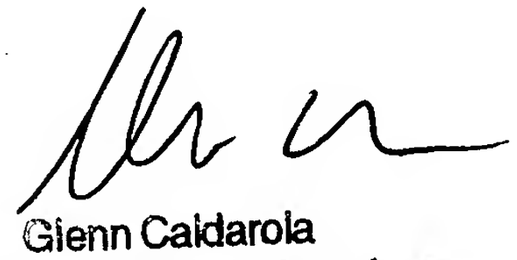
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom P. Duong whose telephone number is (571) 272-2794. The examiner can normally be reached on 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Duong
August 12, 2005
TD



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